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HOME CARE MOBILE APPLICATIONS: SURVEY

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Abstract

Recently, with Coronavirus, mobile applications are becoming more important especially these days because all people stay at home and they couldn't visit the hospital, and the clinic outside becomes a danger. So the use of mobile phone technologies is becoming more and more beneficial for patient care. Mobile technology has the potential to affect health care. The increasing number of people suffering from chronic diseases is putting pressure on the healthcare sector. Population aging is now a major health care concern in many countries of the world. Elderly patients need more healthcare efforts that imply higher healthcare costs, because of that a set of applications have been developed that help care for patients from their homes. In this paper, many mobile healthcare applications are discussedin order to be identified and used to build a new system that helps care for patients from home.

Keywords: Information Technology, Human Resources, Healthcare, Electronic Data Exchange.

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1. Introduction

With the development of technology, the evolution of home health care has become possible, while it is possible to care and follow the patient's condition from home.in the past two decades, Mobile phone technologies have greatly advanced.In many mobile applications, these technologies are now widely used, especially for health..[1]

Remote health monitoring,including Portable sensor and many healthapps, draws interest from the communications and healthdivisions, decreases patien

monitoring costs and increases the quality of treatment in hospitals or at home during the recovery time, thus enhancing patient's quality of life. [2]

Especially in the case of the difficulty of patient going to the hospital, as happened with the current situation in the spread of Corona virus and curfews that affected periodic reviews and the doctor's follow-up of the patient's condition, which increased the need to use programs to care for the patient from home. In this paper, a system is designed and implemented to track the patient's condition from home and based on smartphone and web service to patients. [3]To monitor physiological information, the portable terminal integrates vital signal sensors. Smartphones utilize as an intuitive interface between man and machine and a platform for transmitting information so that the patient and doctor can easily follow the patient's health status and give the appropriate treatment without the need to leave the home. From that we can conclude the following:

Firstly, "Reducing the time and effort that the patient can spend to reach the hospital or the specialist doctor." Secondly, "the patient does not make an appointment with the doctor, as he can obtain information about his medical condition at any time. Third, "The condition can be monitored by any other family member who is allowed to enter the application and this is very useful if the patient is in a state of danger or unconscious." Fourth, "an economical idea, as electronic advice is cheaper than consulting a doctor, as subscribing to the application is either free or for a nominal amount per month." Finally, the patient 's location can be obtained via an external GPS or an internal Wi-Fi signal. [4]

Review of Literatures

In the last decade, researchers have gained significant interest from healthcare surveillance systems. The primary objective was to establish a secure patient management system so that patients who are either hospitalized or doing their regular everyday activities can be tracked by healthcare professionals. We will discuss some of the devices used for health monitoring appliances here.[5]

1. Remote health monitoring of elderly through wearable sensors (2019)

The systems, in general, aim at allowing elderly, disabled, and people with chronic conditions live safely at their home environment. In addition, AAL systems enable collaboratively assisting environment controlled by health-givers (e.g., family, friends and medical staff). These systems consist of different kinds of wearable medical sensors, smart phones, wireless sensors and actuators, computer hardware, computer networks, softwareapplications, which are interconnected to exchange data and provide services in an Ambient Assisted environment.

The main task for the system is to monitor physiological data collected from patient's wearable device, then, upon that a data record created in the data-center, and ultimately provide access to these data by authorised health-giver and doctors at anytime in anywhere. The system consists of three main layers that collaborate to achieve system goal. Each layer has its own requirements and techniques, for example, in patient's layer, the key requirements are that the sensors and the gateway should be able to communicate with the data-center to store patient's sensors data. [6]

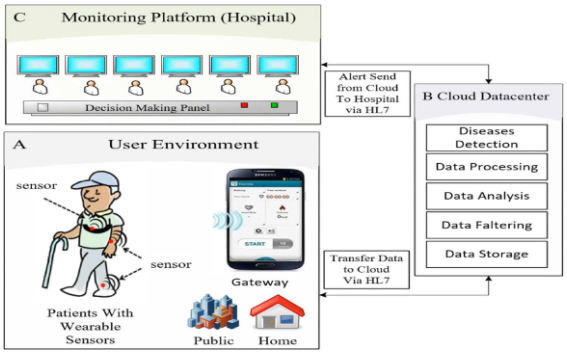

Figure (1)High-level overview of system architecture

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2. Design and Implementation of Mobile Patient Monitoring System 2018

The use of patient management systems provides efficient communication to quickly gather patients and send patient parameters to health providers in real time and receive feedback. Such systems are advanced by Near Field Communication technologies. The definition and application of the patient management system will be realized. The main goal of the system is to accelerate the efficiency of the system and these apps are not only planned for elderly patients, but for all patients.There is a challenge in integration of heterogeneous information systems with increasing number of involved systems having complexity in an unmanageable way.

Following the transfer of the requisite clinical data to the central server by the patient, the device is enabled. These are can be seen on algorithm/flowchart at Figure 1

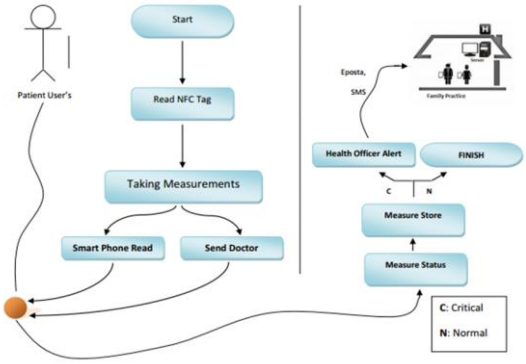


Figure 2. The developed mobile patient monitoring system algorithm

In that system it's used that totally open source code for transferring and saving the data taken from the measurement circuit to the central server and for letting to analyze by authorized persons. We can put in order the components like micro controller code which run on Arduino SDK, mobile application which run on Android operation system and MySQL database management to keep data on a remote server.

In that system mobile application has a key role. Mobile application is look like an interface while it is communicating with the hardware unit and also it is used for transferring the taken clinical data to remote server.

The measurement circuit components are shown in Figure 2. The hardware components of measurement circuits are; NFC enabled device for taking the ID of patient, e-Health sensor platform for taking diabetes,oxygen, body temperature measurements, Arduino micro controller platform for processing these data and lastly wireless network system to transfer these processed data to the server.[7]

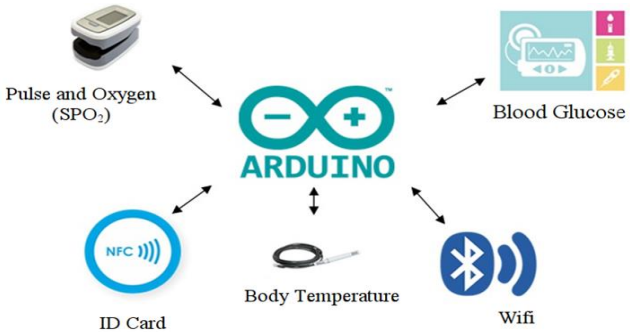


Figure3. MPMS's Hardware Ecosystem

3. Iot Based Health Monitoring System Using Android App(2017)

The aim of this project is to create an IOT based application for monitoring patient. The advancement of Body Sensor Network in healthcare applications have made patient monitoring more feasible. We are proposing an Android Mobile application based Health care system using Body Sensor Network (BSN). The

nodes of BSN include Temperature, Humidity and Pulse Rate Sensor. The proposed framework is effective in taking care of the issues confronted by patients and doctor by observing human exercises and interfacing with the living condition.

The architecture of Health Monitoring system is shown in Figure-1. Tracking the body Vitals through BSN and smart objects are described in first part. Uploading the data to the cloud are discussed in second part and Application controls is the third part[8]

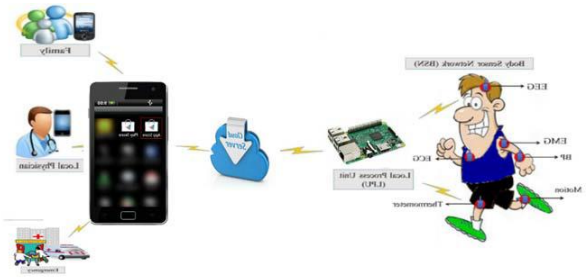


Fig. (4)architecture of Health Monitoring system

4. Healthcare Monitoring Mobile Application Using Wearable Sensors (2017)
In the proposed system, the data collected from human body using some devices (sensors), is directly sent to the android mobile application through wireless communication (like Bluetooth). The data is analysed by system server as well as the doctor. This will help the user to take some immediate action. System server will analyse that data and send it to user as well as the doctor. This will also reduce the workload of doctor.
If suddenly network fails on patient's or doctor's device then the system will store the backup on the mobile device along with the previously collected data. This data will help patient to take some emergency action at that point of time and after network access resumes the new data will updated on device which will be useful for next emergency cases.

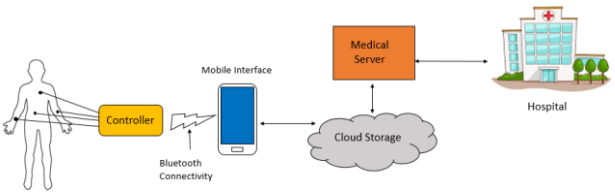


Figure (5)Architecture of Purpose system

In the purpose system, patient can check temperature, Humidity, blood pressure, diabetes by using mobile app and some sensor. Client can have required registering their information on the system server to get login ID and password. By using this login ID and password they logged in to the mobile app. Patient can attach the sensor to the body, and start the mobile app. The sensors are activated and send data to the mobile app through controller by using Bluetooth connectivity. This data will be sent to the medical server for further processing.
The medical server will access this data and analyse it by some computation and generate report. Report contains sensor parameter related to disease and some suggestion for the patient to take immediate action. This report will be sent to the patient as well as doctor and this information is also stored on cloud storage and server's database. Doctor will access patient details anywhere from medical server on his application and send his suggestion to the patient. Patient will use this report to take medical action. All this information backup is also store on mobile device locally so that application can access the data in case of network problem.[9]

5. Real Time Health Care Monitoring System Using Android Mobile 2016
The prime aim of the project is to design and implement effective health care monitoring dashboard. The proposed system monitor the vital parameters like ECG, Temperature, BP, Heart rate etc. and transmit wirelessly through ZigBee technology. The transmitted data is displayed in the PC based application called the central nurse station where PC with the receive ZigBee acts as hub. This data gets updated into

database continuously. From the database the android application fetches all the updated data and displays it.This enables the doctor to receive the current status of the patient in real time. If any parameter of a particular patient goes beyond a preassigned threshold value, an automated notification will pop up in doctor android mobile application. Android application can also generate call option if the doctor won't notice notification. Additionally system is also able to generate alarm to notify nurse around for emergency treatment.

The system main object is to monitor the patient health status in real time and notify relevant doctor or nurse instantly if the patient is in risk

The proposed system includes few of the hardware and software equipment's. The basic hardware requirements are sensors, power supply, LPC2148 microcontroller, LCD, buzzer, ZigBee modules and software as follows Keil IDE, Flash Magic, Visual Studio IDE, Eclipse IDE.

This project involves two nodes i.e. two patients are monitored simultaneously at a time. Output of each module is explained step by step.

Step1: Once power is supplied to the hardware, LCD displays "welcome to IOT based health care monitoring system".

Step2: Next the controller fetches data from sensors which are attached to the patient body and display on the LCD

Step3: Simultaneously this data is transmitted to the central nurse station through ZigBee technology The received data may be from different patient which are segregated depending upon the patient bed ID and then it displayed on the PC based application GUI.

Step4: PC based application uploads the data from PC to global database which can be fetched from authorised people from anywhere and anytime. Uploaded data with database table.

Step5: The android application is also developed in order to display the patient status,

Step6: During emergency or critical condition of the patient,doctor get notification message and call option is also included.[10]

6. Remote Mobile Health Monitoring System Based on Smart Phone and Browser/Server Structure 2015

RMHM System based on smart phone and web service is designed and implemented for patients with chronic diseases, especially the elderly. The portable terminal integrates vital sign sensors to monitor physiologic data. Smart phones are used as both an intuitive human-machine interface and an information transmission platform so that a user can easily master his/her own health status. Through the Android software, the user's position can be acquired by outdoor GPS or indoor Wi-Fi signal. The remote server uses B/S (browser/server) structure to provide data query, observation curve, and patient location. This will greatly strengthen the flexibility of the system

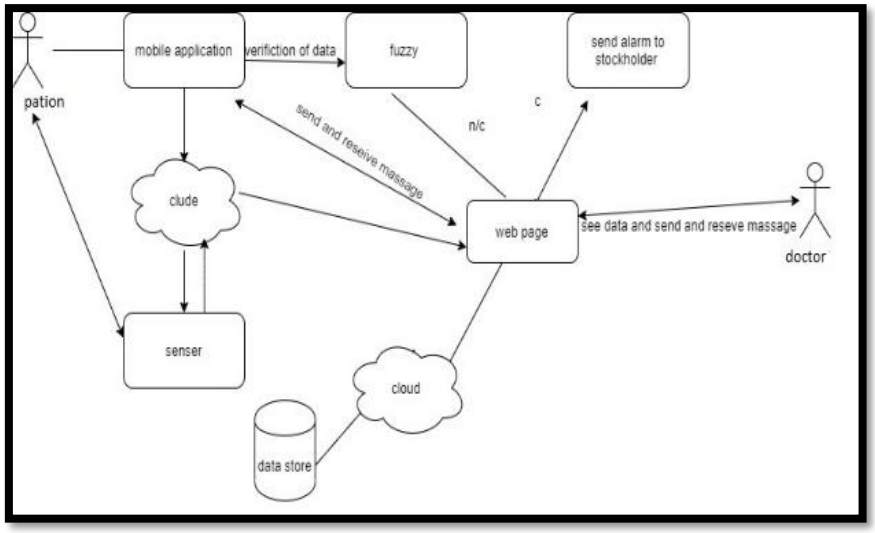
the portable terminal is worn by the patient. It is capable of sensing and dealing with one or more physiologic signals. For example, the motion sensor is mainly used to judge whether the patient is performing highintensity activities or possible falling. Heart rate sensors can determine whether the patient's body status is normal. If abnormal status is detected when the patient is moving, the system will immediately issue an alarm to avoid an unexpected situation. The middle tier represents the smart phone, which employs the Android operating system. Physiologic data acquired by the portable terminal can be displayed on the smart phone screen. If necessary, it can also issue a vibration and voice alarm. With Android software embedded in the smart phone, the patient's position can be determined by GPS or Wi-Fi. In an emergency situation, the patient's moving track can also be recorded in the webserver database and displayed on the webpage. In this paper, Bluetooth protocol is employed as the communication channel between smart phone and portable terminal.[11]

7. Real time wireless health monitoringapplication using mobile devices(2015)

present a smartphone based wireless healthcare monitoring system (WHMS), which can provide real time online information about medical status of a patient. In addition alarming and reminding messages about the patient health status can also be sent to patient mentors for necessary medical diagnosis and advising. The proposed system consists of sensors, a data acquisition unit, smartphone, and the LabVIEW program. The system is able to display, record, and send patient's physiological data. Moreover, the proposed WHMS also supports Internet connectivity so that the healthcare professionals can monitor and access patients' data from anywhere of the world at any time. The patient is equipped with biomedical sensors, which transform the changes in the monitored physiological quantities into electronic data that are measured and recorded. The LabVIEW program assists monitoring and displaying the data. The patient's temperature, heart beat rate, muscles, blood pressure, blood glucose level, and ECG data can be monitored by our present system. Our careful design of the hardware and software components of the system is able to fulfil any further requirement of the users.

The system operating procedure is as follows:
1. We place three electrodes of ECG on the patient's body (i.e., right hand, left hand and right leg
2. We connect the Arduino Shield with a temperature sensor, a blood pressure sensor, and a blood glucose level sensor.
3. From the Arduino shield we connect a wireless node (as a transmitter) and the USB port of the tablet (as a receiver) or the smartphone that has LabVIEW software running on it
to take the reading of the physiological data from the patients' body. The data are then processed and displayed on LabVIEW front panel by using Data Dashboard application.
4. The data are also saved according to the time and presented in a report format. In addition some personal details of the patient are also recorded.
5. The data is then published in the internet so that the patient's data can be accessed by the authorized healthcare personnel from anywhere at any time.)[12]

Advanced Contribution 2020
A New system was developed to monitoring the situation of heart patients by the specialist doctor. This is done by setting a sensor to read the patient's heartbeat. This sensor is programmed using Arduino, and the results are displayed either on the website or on the mobile phone as an application. we usedASP.NET with Heart Pulse Sensor, ECG and fuzzy Algorithm. Figure (6) Illustrate proposed system architecture



Figuer. 6: - Proposed System Architecture

Fuzzy algorithm used Determine the critical or normal condition, so that the patient can know his health status by the doctor supervising the case. According to the National Institute of Health and American Heart Association, the average resting heart rate for adults is between 60 and 100 beats per minute. We put the value of threshold and if the readings larger or smaller of normal it can determine whether the patient is in a stable condition or not

Results of the proposed system
Some of readings will be tacking and then analyze according fuzzy:
If readings from 1- 8 will be tackingand fuzzy values were given to it, all results are recorded in the table (1):
Table (1): - Result Analyze

Id	Readings values of sensor	Fuzzy values
1	98	0.9
2	84	0.8
3	97	0.9
4	70	0.7

5	95	0.9
6	62	0.6
7	88	0.8
8	55	0.5

By tacking the average value of fuzzy values as follow:
Average = Fuzzy value / no. of readings [12]
From table (5) the summation of fuzzy value equal "0.6-0.9" and the number of readings 8, So the average will be 0.6. Since the values between (72 – 82) are the best, the result should be compared to the fuzzy value of this range. Fuzzy value for 72 – 82 equals to 0.7, this meaning 0.7 is the best value. 0.6 is close to the good, so it is considered to be good state of patient now, the chart of heart pulse will be illustrating for the example in paper:

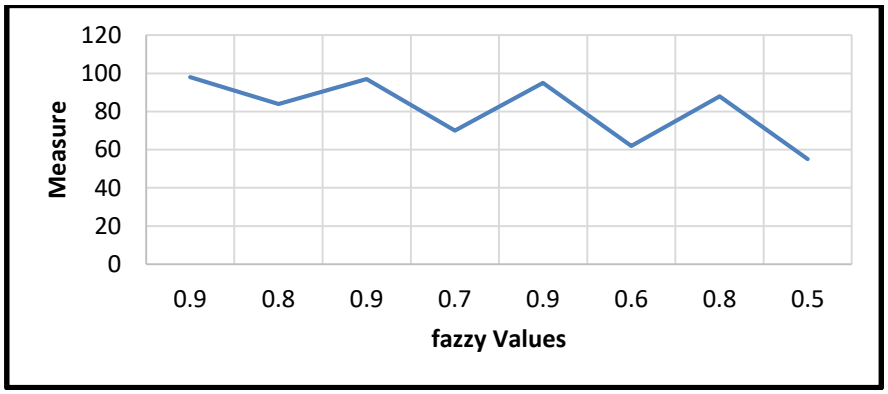


Figure. (7): - Heart Pulse "example 1"

To determine the accuracy of the project three people tested
heart rate sensor .The first is a young male, the second is a middle-
aged woman, and thethirdis an elderly woman. The heart rhythm of each of these individualsIt is compared i n two ways, as seen in the table. The first method is to use a fingertip pulse oximeter to record your heart rat e.
The second method is to use a digital heart rate measurement blood pressure monitor. [14]as it is illustrated in table 2

Table (2): Comparison between this paper heart rate sensor and three other methods
.

id	This Paper (BPM)	Pulse Oximeter Fingertip (BPM)	Digital Blood Pressure (BPM)
No.1	88	89	87
No.2	79	78	77
No.3	67	68	68

Conclusions
In this paper, a survey on several researches concerning smartphone based health monitoring system . By using the system the healthcare professionals can monitor, diagnose, and advice their patients all the time. The physiological data are stored and published online. Hence, the healthcare professional can monitor their patients from a remote location at any time. Our system is focus on cardiac patients from the elderly, where technological advantage was gained at the present time and with the help of the Internet network, the patient can communicate with the doctor remotely, when The results are normal within the range (60-100), but whenthe results is But when the result is greater than 100 or less than 60, the situation is critical and the device alerts the stoke holder to take action, and the system can Ignores the inaccurate results of the

sensors. The use of Fuzzy algorithm helps in determining the state of health more accurately as it classifies readings in a way that makes the result clearer the reliability and validity of our system have been ensured via field tests. The field tests show that our system can produce medical data that are similar to those produced by the existing medical equipment.

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References

Ajiroghene, O. , Obiei-uyoyou, O.," Development of an Autonomous Mobile Health Monitoring System for Medical Workers with High Volume Cases."JournalAdvances in Robotics A & Automation. (2015), S2:1

Lakmini P. Malasinghe1 · Naeem Ramzan1 ,"Remote patient monitoring: a comprehensive study" Journal Ambient Intell Human Comput (2019)

Pınar Kırcı1, Perin Ünal2," Personalization of Mobile Health Applications for Remote Health Monitoring" 1Istanbul University, Department of Engineering Sciences, Istanbul, Turkey(2016)

Soumya S. Kenganal1, Dr.Rengaprabhu P2," Real Time Health Care Monitoring System Using Android Mobile" International Journal of Advanced Research in Electrical,Electronics and Instrumentation Engineering Vol. 5, Issue 5, May 2016)

Sachin Patil1,Kaustubh Gaikwad2,Visha Ravi Sekhar, "Android Based Health Care Monitoring System" IEEE Sponsored 2nd International Conference on Innovations

Mohammed Al-khafajiy1 · Thar Baker1 · Carl Chalmers1," Remote health monitoring of elderly through wearable Sensors" Multimedia Tools and Applications (2019)

Bulent,C.,I.F.Oguzhan Atmaca,"Design and Implementation of Mobile Patient Monitoring System" global scientific journals vol 6,(2018)

Ranjeet Kumar, Rajat Maheshwari, Amit Aggarwal, M. Shanmugasundaram and Sundar S," IOT BASED HEALTH MONITORING SYSTEM USING ANDROID APP" ARPN Journal of Engineering and Applied Sciences(VOL. 12, NO. 19, 2017.)

Akash Bondage4 Prof. Sunil D Rathd,"HEALTHCARE MONITORING MOBILE APPLICATION USING WEARABLE SENSORS: Multidisciplinary Journal of Research in Engineering and Technology,(Volume 4, Issue 3. 2017)

. Soumya S. Kenganal1, Dr.Rengaprabhu P2," Real Time Health Care Monitoring SystemUsing Android Mobile" International Journal of Advanced Research in Electrical,Electronics and Instrumentation Engineering:(Vol. 5, 2016)

Yunzhou Zhang1, Huiyu Liu1, Xiaolin Su1, and Dongfei Wei1" Remote Mobile Health Monitoring System Based on Smart Phone and Browser/Server Structure" Journal of Healthcare Engineering · (Vol. 6 · No. 4 · 2015)

Real time wireless health monitoringapplication using mobile devices(2015)in Information,Embedded and Communication systems)(2015)